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Forest Health Protection
Pacific Southwest Region

Date: October 23, 2004
File Code: 3420

To: District Ranger, Almanor Ranger District, Lassen National Forest

Subject: Evaluation of the Willow Lake Dispersed Camping Area
(FHP Report NE04-11)

At the request of Jane Goodwin, District Resource Officer, I conducted a field evaluation of the Willow Lake dispersed camping area on the Almanor Ranger District on September 23, 2004. The objective of my visit was to evaluate the current forest health conditions within and adjacent to the undeveloped campground and to provide management recommendations as appropriate. These recommendations will assist with planning future activities, including campground placement, design, and hazard tree management within the Willow Lake area.

Background

The Willow Lake dispersed camping area is located on the Lassen National Forest, about 8 miles northwest of Chester, CA, at an elevation of 5700 feet. Precipitation for the site averages greater than 40 inches per year. There are approximately 6 undeveloped campsites near the lake, with vehicle access, that are used seasonally from early June to mid-October. The campground sits at the base of a southwest-facing slope and is adjacent to the lake. The forested area in and around the campground is a Sierra mixed conifer type. White fir (*Abies concolor*) is the dominant species within the campground, making up 95% of the stand both in the overstory and understory. Jeffrey pine (*Pinus jeffreyi*) is present within about 5% of the stand. The stand is a mix of tree sizes from large diameter (20% of the stand) to saplings (30% of the stand). Just north of the campsites, incense cedar (*Libocedrus decurrens*), sugar pine (*Pinus lambertiana*) and red fir (*Abies magnifica*) are present in small numbers. The area north and east of the campground has the highest understory stand density, consisting mostly of white fir.

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Observations

Several biotic agents such as dwarf mistletoes, root diseases, stem decays, and engraver beetles are affecting white fir throughout the campground. Many of the older white fir have unhealthy crowns with dead tops, dead limbs and thin foliage. In addition, extensive root and bole decay was observed in many stumps of recently felled dead trees and some standing live trees (Figures 1 and 2). Evidence of Armillaria root disease (*Armillaria* sp.) was found in one stump in the form of rhizomorphs. Extensive decay at the root collar, a symptom of *Heterobasidion annosum*, the causal agent of annosus root disease, was observed in some stumps, however, specific signs, such as conks and laminated decay, were not found. Stump inspections also revealed that annual growth for some trees in this stand has stagnated over the past 50 years.

Figure 1. Stump of felled white fir infected with *Armillaria* sp. and *H. annosum*.

Figure 2. Extensive bole decay in both a standing and snapped off white fir.

Dwarf mistletoe (*Arceuthobium abietinum* f.sp. *concoloris*) has infected nearly every white fir tree within the campground and has caused considerable branch dieback and bole and limb swellings (Figures 3 and 4).

Fir engraver beetle (*Scolytus ventralis)* is causing top-kill or whole tree mortality in a few trees within the campground and Jeffrey pine beetle (*Dendroctonus jeffreyi*) has killed a couple of Jeffrey pines within the last few years.

There is evidence of mechanical injury on many trees resulting from campers hammering nails into trees and cutting into trees with hatchets or saws.

High foot and vehicle traffic is occurring in and around the campsites. This is evidenced by the lack of vegetation in many areas and is likely resulting in highly compacted soils around tree roots in addition to direct root damage.

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Figure 3. Female shoots of fir dwarf mistletoe and limb swelling.

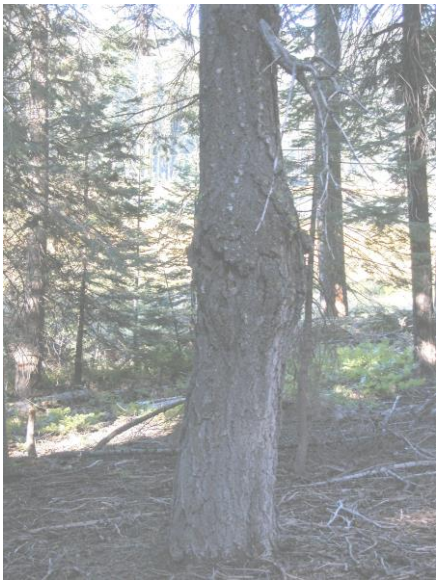

Figure 4. Extensive bole swelling at fir dwarf mistletoe infection site.

Discussion and Recommendations

Trees in the Willow Lake dispersed camping area, similar to most forested campgrounds, are exposed to additional stress factors that can compromise their health and vigor. Firewood collecting sometimes leads to tree wounding from hatchets and saws, foot and vehicle traffic from campers can result in increased soil compaction and root damage, and the desire for screening between campsites can result in overstocking of understory trees.

Root decay caused primarily by *H. annosum* and secondarily by *Armillaria* sp. and potential decay at dwarf mistletoe bole swellings, all in white fir, are the most serious conditions identified in the Willow Lake dispersed camping area. Many trees have been felled within the past few years that had previously succumbed to some combination of root disease, dwarf mistletoe and fir engraver beetle. Some of these trees were likely hazardous before they died. With this many trees affected in a campground, it is critical that the remaining live trees are evaluated and potential hazards identified. Treatment for a hazard tree (a defective tree located where it could kill or injure people or damage property if it fell) is to remove the tree or to keep people away from the tree. The most effective ways to keep people away from hazard trees are to move the facility (picnic table, campsite, toilet, etc) or construct barriers around the trees.

Many trees within the campground have large bole and limb swellings caused by fir dwarf mistletoe. White fir within the camping area that exhibit bole swellings should be carefully inspected for loose bark and stem decay, as these swellings can be an entry court for decay fungi. If decay is present, the tree should be considered a hazard and removed. Trees with bole swellings that do not reveal decay should be monitored closely. For trees with branch swelling and brooms, depending on the degree of symptoms, consideration should be given to tree removal or at a minimum selective pruning within the crown to remove the dead or diseased limbs that could snap off and

strike campers. Depending on the level of dwarf mistletoe infection, removal of infected limbs can improve the health and vigor of the tree as long as at least 50% of the original live crown remains after treatment.

Soil compaction within the campground may be partially responsible for predisposing the fir trees to root diseases and bark beetle attacks. Compacted soils tend to suffocate roots, limiting the available oxygen that is necessary for root growth and survival. Damaged and unhealthy roots cannot provide the upper portions of the tree with the water and nutrients it requires to maintain its natural defenses. Root damage is a long-term problem that may not reveal itself until several years after the damage has occurred. In order to minimize future soil compaction and root damage, campers should be confined to specific travel corridors from campsites to restrooms, water sources, and specific recreation areas. It is especially important to divert and limit foot and vehicle travel as much as possible from the root zones of trees.

Stands within the campground would benefit by the removal of diseased trees and hand thinning of the understory trees. When thinning trees in the campground, it is recommended that you select for a mix of tree species with priorities given to species other than true firs. In addition, when selecting trees for removal, preference should be given to trees infected with dwarf mistletoe, root disease, trees infested with bark beetles and trees with extensive human caused injuries. For root diseases it is reasonable to use the condition of the crown as an indicator of advanced decay. Although not always caused by root decay, a thin crown does indicate poor tree vigor. A tree with reduced photosynthesis is not able to maintain healthy roots as well as a tree with a full and healthy crown. In the presence of root disease, unhealthy roots will likely be overcome with decay faster than vigorously growing roots. For this reason, the thinner the crown of a tree in an area where root disease is present, the more likely it is that the roots have been weakened by decay.

Dense stands adjacent to the campground would also benefit from thinning. Trees should be thinned to a basal area appropriate for the site in order to improve stand health and vigor. To reduce the susceptibility to future bark beetle related mortality, stands should be thinned to densities that are 80% or less of “normal”, effectively reducing tree competition for limited water and nutrients. Furthermore, selecting for more drought tolerant species such as Jeffrey pine and incense cedar over red and white fir will increase species diversity and make the stand more resilient to disturbance agents such as insects, disease, and fire. Thinning can also decrease the need to enter stands to conduct salvage operations, decrease the amount of fuel loading and reduce the number of hazard trees. When planning such thinning, it should be recognized that this is an average to be applied across the landscape and some variability may be desired. Individual high value trees, such as mature pine, as well as pure stands of younger ponderosa and Jeffrey pine should benefit by having the stocking around them reduced to lower levels. In addition to reducing tree stress, thinning, especially of the understory, will somewhat reduce the risks and damage from any fire that might occur and provide a more defensible space for the campground.

It is important to note that when implementing tree removal or hand thinning in a recreational site, Region 5 direction calls for the treatment of all conifer stumps with a registered borate compound to reduce the probability of infection by *Heterobasidion annosum*, the causal agent of annosus root disease. Care also needs to be taken to minimize both wounding of residuals and site disturbance. If regenerating any openings created during thinning and hazard tree removal is desired, planting Jeffrey pine, incense cedar or rust resistant sugar pine seedlings should be considered over natural regeneration of true fir, since these species are not hosts for the fir strain of annosus root disease or fir mistletoe.

General Recommendations for Campgrounds

Maintaining and promoting healthy trees are important objectives for development plans in campgrounds. Care should be taken during future campsite, trail and facility construction to minimize negative impacts on the landscape. The following guidelines should be applied for areas under construction or in areas where future construction will take place.

- Tree density should be appropriate for the site. This will provide access to light, moisture and nutrients and allow the trees to better cope with their altered environment.
- Trees that will directly interfere with structures or that will be seriously damaged during construction or excavation should be removed.
- Leave a mixture of ages and species to provide a continual forest canopy over the years.
- Fence off individual or groups of trees before construction to negate or minimize root damage by soil compaction or trunk and root damage by equipment. Protective fences should be placed, at a minimum, at drip line. Depending on the species, tree roots can exist within a radius two times the crown radius and encompass an area well beyond drip line. Drip line is defined by the outer edge of the foliage. Penalties for damaging trees should be incorporated into tree removal or construction contracts.
- Road or lot grades should be changed as little as possible. Grading damages roots and can set up conditions that favor soil erosion. It can also alter the contour such that the flow of surface and subsurface water is drastically affected.
- Trenches should always be dug away from tree roots.
- Do not back fill with earth or rocks around the trunks of trees.
- Avoid paving with either concrete or asphalt over root systems, or close to the trunks of trees.
- Use caution in applying wood preservatives and other chemicals to buildings. Trees and other plants have been killed by direct contact with them or as a result of their runoff in rainwater.
- Avoid leaving green pine slash on site to prevent the build up of pine engraver (*Ips pini*) beetle populations that may attack standing green trees.

Future construction or vegetation management activities that incorporate the above guidelines will help assure the existence of vigorous and healthy trees following project completion.

Despite the effectiveness of any long or short-term plans to prevent tree injury and mortality, some trees, through declining health, will eventually become hazards to the public. To minimize the risks associated with hazard trees, they should be identified and removed before they fail. The current practice for campgrounds on the Lassen National Forest is to remove trees as they die. This eliminates the risk from dead trees but fails to address living trees that are infected with root disease, heart rot, and/or have a structural defect. These high-risk green trees are equally hazardous and should not be overlooked. Therefore, it is recommended that the Forest develop a hazard tree evaluation and monitoring plan for its campgrounds. At your request, Forest Health Protection can provided information and assist with the development of this plan. In the short-term, trees within the campground that have obvious stem decay, dead tops and/or large dead branches should be carefully evaluated and hazards removed or pruned as soon as possible.

Conclusion

Any future modifications to the Willow lake area should incorporate a long-term vegetation management plan that includes a hazard tree evaluation and monitoring plan for campgrounds. The recommendations provided in this evaluation combined with input from the District and/or Forest silviculturist will help insure the continued presence of healthy trees that will provide shade, campsite screening and visual/aesthetic qualities for these recreation areas.

Forest Health Protection can assist with funding for thinning and removing green material from overstocked areas within and adjacent to the Willow lake area on a competitive basis. Funding is also available on a competitive basis for treating dwarf mistletoe infected stands, including the pruning of infected limbs. If you are interested in this funding please contact any of the Forest Health Protection entomology staff for assistance in developing and submitting a proposal.

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If you have any questions regarding this report and/or need additional information please contact Danny Cluck at 530-252-6431 or dcluck@fs.fed.us.

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